

CELLULAR AND MOLECULAR BIOLOGY FORMATIVE EXAM I

September 8, 1998

DIRECTIONS: For the following questions, select the one best answer or completion.

1. Extracellular crosslinking of tropocollagen molecules is initiated by:
 - ☒ A. lysyl oxidase.
 - B. proline hydroxylase.
 - C. lysyl hydroxylase
 - D. the N-terminal propeptide.
 - E. the C-terminal propeptide.
2. A structural motif that joins two polypeptide chains:
 - A. EF hand
 - B. 8-fold alpha/beta-barrel
 - C. 4-helix bundle
 - ☒ D. leucine zipper
 - E. alpha/beta with saddle in core
3. The Ramachandran diagram shows the sterically allowed values for the:
 - ☒ A. psi and phi angles of the bonds formed by the alpha carbon in a polypeptide.
 - B. angle between the C=O and the N-H of the peptide bond.
 - C. angles of the side chains of the alpha-helix and of beta-pleated sheet.
 - D. angle of the right-turn twist of the beta-pleated sheet.
4. Hydrophobic interactions might be expected between the "R" groups of which of the following:
 - A. K and E
 - B. E and D
 - C. E and F
 - ☒ D. I and L
 - E. R and K

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5. A weak acid (HA) has a pK of 3.0. When a solution of the acid is adjusted to pH 4.0 with a base such as NaOH, the ratio $[A^-]/[HA]$ is:
- A. 0.01
 B. 0.1
 C. 2
☒ D. 10
 E. 100
- Handwritten notes for question 5:
 $\text{pH} = 4.0$
 $\text{pK} = 3.0$
 $\frac{\text{Base}}{\text{Acid}} = 10^{\text{pH} - \text{pK}}$
 $10^{4.0 - 3.0} = 10^1 = 10$
6. "Edman degradation" refers to:
- A. a chemical method for determination of the C-terminal sequence of proteins and peptides.
☒ B. a chemical method for determination of the N-terminal sequence of proteins and peptides.
 C. a combination of enzymatic and chemical methods for determination of the N-terminal sequence of proteins and peptides.
 D. an enzymatic method for determination of the N-terminal sequence of proteins and peptides.
 E. a combination of enzymatic and chemical methods for determination of the C-terminal sequence of proteins and peptides.
7. Which of the following is not a component of a normal plasma membrane?
- A. phospholipids
 B. cholesterol
 C. carbohydrates
 D. proteins
☒ E. nucleic acids
8. The process where a molecule enters a cell faster than predicted by the Law of Diffusion is called:
- A. simple diffusion
☒ B. facilitated diffusion
 C. uniport
 D. symport
 E. antiport

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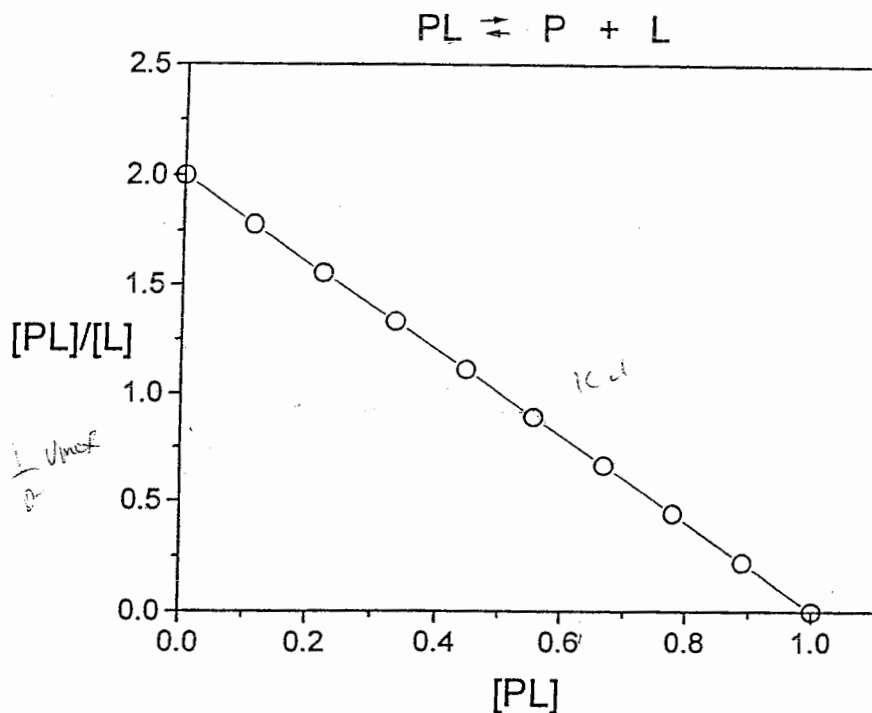
9. Proteins synthesized on soluble polysomes include:
- A. mitochondrial proteins
 - B. peroxisomal proteins
 - C. nuclear proteins
 - D. soluble proteins
 - ☒ E. all of the above
10. Receptor Mediated Endocytosis involves:
- A. clathrin-coated pits.
 - B. clathrin-coated vessicles.
 - C. the CURL.
 - D. specific ligand receptors.
 - ☒ E. all of the above.
11. Which of the following is not a component of the normal cytoskeleton:
- A. actin
 - ☒ B. myosin
 - C. intermediate filaments
 - D. microtubules
 - E. none of the above
12. The phase of mitosis where the chromatids are aligned in a plate is called:
- A. interphase
 - B. prophase
 - ☒ C. metaphase
 - D. anaphase
 - E. telophase
13. The major chemical component of mitochondrial membrane is:
- A. cholesterol.
 - B. carbohydrates.
 - ☒ C. protein.
 - D. phospholipids.
 - E. vitamins.

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14. Primary active transport implies that:
- A. movement of sodium ions occurs down the electrochemical gradient.
 - ☒ B. an energy source is required.
 - C. sodium ions move into cells in exchange for amino acid molecules.
 - D. sodium ions can only leave the cell, not enter.
 - E. the concentration of potassium ions inside the cell is lower than outside.
15. The cell (plasma) membrane consists of a:
- A. protein molecular monolayer.
 - B. protein bilayer with occasional interspersed cholesterol molecules.
 - ☒ C. fluid phospholipid bilayer with integral protein molecules.
 - D. semipermeable bilayer of pure lecithin.
 - E. fluid mixture of monoglycerides and triglycerides.
16. With respect to facilitated diffusion:
- ☒ A. transport through the membrane is an equilibration process.
 - B. transport can occur in only one direction.
 - C. ATP is directly required as an energy source.
 - D. very few solutes enter the cell by this mechanism.
 - E. solutes can only leave the cell by this mechanism, not enter it.
17. Which of the following properties is NOT characteristic of myoglobin?
- A. It has a single O₂ binding site.
 - ☒ B. It binds O₂ with strong positive cooperativity.
 - C. It binds O₂ with high affinity compared to hemoglobin.
 - D. It binds O₂ in a hyperbolic fashion.
 - E. Its structure is dominated by alpha helix.

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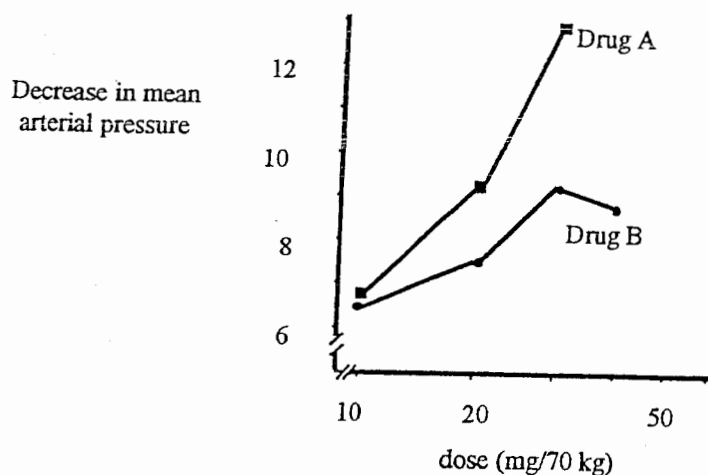
18. The slope of the plot shown below defines:



- A. the number of ligand binding sites on the acceptor.
 B. the square of the dissociation constant.
 (C) the negative inverse of the dissociation constant.
 D. fractional saturation.
 E. the Hill coefficient.
19. A Hill coefficient of 3 would indicate:
- A. a maximum of 3 ligand binding sites.
 B. strong negative cooperativity.
 (C) strong positive cooperativity.
 D. fewer than 3 ligand binding sites.
 E. noncooperative ligand binding.
20. The standard free energy of a reaction:
- A. determines the rate at which the reaction will occur.
 (B) determines the equilibrium position of a reaction.
 C. is reduced in enzymatic catalysis.
 D. is increased in enzymatic catalysis.
 E. is the energy required for the formation of the transition state.

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24. The data in the following graph are derived from a clinical trial comparing two drugs to treat hypertension. It is known that both drugs cause the effect by acting at the same receptors.



Which statement best describes the results?

- A. These are 2 agonists
 - B. A is an agonist; B is a competitive antagonist
 - ☒ C. A is an agonist; B is a partial antagonist
 - D. B is an agonist; A is a partial agonist
 - E. B is an agonist; A is a noncompetitive antagonist
25. During beta oxidation of fatty acids, the following compounds are generated EXCEPT:
- A. beta-ketoacyl-CoA
 - B. acetyl-CoA
 - C. fatty acyl-CoA
 - ☒ D. NADPH
 - E. FADH_2
26. The reducing power ($\text{NADPH} + \text{H}^+$) for fatty acid synthesis in the cytosol is provided by:
- A. oxidation of dihydroxyacetone phosphate.
 - B. extramitochondrial oxidation of malate catalyzed by malic enzyme.
 - C. catabolism of glucose 6-phosphate via the pentose phosphate pathway.
 - D. both A and B.
 - ☒ E. both B and C.

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27. In liver the immediate precursor of acetoacetate is:
- A. beta-hydroxy butyrate
 - B. acetoacetyl-CoA
 - C. beta-hydroxy butyryl-CoA
 - D. mevalonic Acid
 - ☒ E. beta-hydroxy-3-methylglutaryl-CoA
28. Which of the following is NOT a major membrane constituent of mammalian cell membranes?
- A. cholesterol
 - B. phosphatidylcholine
 - C. protein
 - ☒ D. triglyceride
 - E. sphingolipid
29. Average values for body fat content are:
- A. 5%
 - B. 10%
 - ☒ C. 15%
 - D. 25%
 - E. 50%
30. HMG-CoA reductase:
- A. catalyzes the reduction reaction for formation of beta-hydroxybutyrate.
 - B. is stimulated by lovastatin.
 - C. is not one of the enzymes in the pathway for synthesis of farnesyl-CoA.
 - D. catalyzes the conversion of lanosterol to cholesterol.
 - ☒ E. is rate limiting for cholesterol synthesis.
31. Fatty acid synthesis and degradation utilize the same:
- ☒ A. acyl carrier
 - ☒ B. redox cofactor
 - ☒ C. subcellular location
 - ☒ D. hydroxacyl intermediate
 - ☒ E. alpha-beta unsaturated intermediate

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32. The enzyme that utilizes coenzyme A as one of its substrates in the beta oxidation cycle of fatty acids is:
- A. acyl dehydrogenase
 - B. enoyl-CoA hydratase
 - C. L-hydroxyacyl-CoA dehydrogenase
 - ☒ D. thiolase
33. An example of a nonpolar lipid is:
- A. lecithin
 - B. phosphatidyl serine
 - C. phosphatidic acid
 - D. palmitic acid
 - ☒ E. tripalmityl glycerol
34. Arachidonic acid:
- ☒ A. is a precursor to prostaglandins.
 - B. has 3 double bonds.
 - C. has 26 carbons.
 - D. is released by the action of phospholipase D.
 - E. is a precursor to cholesterol.
35. Phase I biotransformation pathways:
- A. predictably generate drug metabolites that are pharmacologically inert, and non-toxic.
 - ☒ B. can modify a variety of chemical structures present on most drugs.
 - C. require the presence of a weak acid or weak base chemical group in the drug.
 - D. only take place in the smooth endoplasmic reticulum of liver cells.
 - E. always generate a permanent electric charge on a drug, making it a candidate for renal tubular secretion.
36. Which of the following is LEAST likely to alter gastrointestinal absorption of another drug:
- A. Cimetidine
 - ☒ B. Penicillin G
 - ~~C. Antacids~~
 - D. Morphine
 - ~~E. Antihistamines~~

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37. Factors that may influence a patient's response to drug therapy include:
- A. percent body fat
 - B. total body mass
 - C. exposure to environmental toxins
 - D. severe liver disease
 - ☒ E. all of the above
38. Which statement **correctly** describes the relationship between lipid metabolism and coronary heart disease?
- A. Excessive amounts of triacylglycerol accumulate in adipose cells which infiltrate into damaged areas of the coronary artery epithelium.
 - B. Saturated fatty acids after oxidation by free radicals accumulate in smooth muscle cells of the coronary artery.
 - C. Saturated fatty acids when consumed in excess are transported by LDL and taken up by macrophages in the wall of the coronary artery.
 - ☒ D. Macrophages infiltrate injured areas of the endothelium of coronary arteries and accumulate cholesterol ester transported by LDL.
 - E. Unesterified cholesterol is transported by HDL to the coronary arteries where it accumulates on the epithelium and is encapsulated with a fibrous cap to form a plaque.
39. Apolipoprotein B₄₈ is found only on which lipoprotein?
- ☒ A. chylomicron
 - B. very low density lipoprotein (VLDL)
 - C. low density lipoprotein (LDL)
 - D. intermediate density lipoprotein (IDL)
 - E. high density lipoprotein (HDL)
40. Cholesterol ester transfer protein (CETP) in HDL facilitates reverse cholesterol transport by:
- A. activating lecithin cholesterol acyl transferase.
 - B. activating apolipoprotein A.
 - C. activating hepatic lipase.
 - D. transferring cholesterol ester from the target cell into HDL in exchange for lecithin.
 - ☒ E. transferring triacylglycerol from VLDL into HDL in exchange for cholesterol ester.

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41. Dietary cholesterol has little effect on the concentration of LDL in the blood because:
- A. dietary cholesterol is resistant to the digestive action of bile acids in the intestine.
 - B. dietary cholesterol can not be incorporated into chylomicrons.
 - ☒ C. hepatic cholesterol synthesis decreases when dietary cholesterol accumulates in the liver.
 - D. dietary cholesterol is resistant to esterification by hepatic acylcholesterol acyltransferase.
 - E. dietary cholesterol is preferentially shunted into synthesis of bile acids in hepatocytes.
42. MCT (Medium Chain Triglyceride) oil can be used as a fat source for patients with pancreatic malfunction because:
- A. it does not require hydrolysis of its esterified fatty acids before being absorbed.
 - B. it has twice the caloric density of triacylglycerol in food, thus, less needs to be consumed.
 - C. it is more readily incorporated into chylomicrons for transport.
 - ☒ D. it does not require emulsification by bile salts with subsequent hydrolysis by lipase.
 - E. its metabolism is not influenced by insulin.
43. Which of these factors decreases mobilization of free fatty acids (FFA) from adipose tissue?
- A. epinephrine
 - B. glucagon
 - ☒ C. eating a high carbohydrate meal
 - D. caffeine
 - E. exercise
44. The best predictor of premature coronary artery disease is the:
- A. concentration of LDL cholesterol in the blood.
 - B. concentration of VLDL cholesterol in the blood.
 - C. concentration of HDL cholesterol in the blood.
 - ☒ D. LDL/HDL ratio in the blood.
 - E. concentration of apolipoprotein B₁₀₀ in the blood.

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45. Which of the following statements regarding the mechanism by which HMG-CoA reductase inhibitors lower LDL cholesterol in the blood is FALSE?
- ☒ A. HMG-CoA reductase inhibitors are structural analogs to HMG-CoA.
 - ☐ B. HMG-CoA reductase inhibitors have a higher binding affinity to the reductase than does HMG-CoA.
 - ☒ C. The concentration of free cholesterol decreases in the hepatocyte.
 - ☒ D. The activity of hepatic LDL receptors is downregulated.
 - ☐ E. LDL enter coated pits in the hepatocyte membrane and then enter the hepatocyte by endocytosis.

FOR QUESTIONS 46 THROUGH 48 USE THE ANSWER KEY BELOW:

- A. Intracellular receptors acting as transcription factors
 - B. Transmembrane tyrosine kinase receptors
 - C. Ligand-gated channels
 - D. G protein-linked receptors generating cyclic AMP
 - E. G protein-linked receptors generating inositol trisphosphate and diacylglycerol
46. Class of receptor mediating the effects of β Adrenergic Agonists (example: norepinephrine).
47. Class of receptor mediating the effects of steroids (example: Cortisol).
48. Class of receptor mediating the effects of Insulin.

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FOR QUESTIONS 49 THROUGH 51 USE THE ANSWER KEY BELOW:

- A. Directly proportional to DOSE, but inversely proportional to CLEARANCE.
- B. A measure of the fraction of a drug dose which reaches the systemic circulation.
- C. Only influenced by the intrinsic ability of the eliminating organ to handle the drug.
- D. That volume in which a drug must be distributed, if it were homogeneously distributed throughout that volume in the same concentration as it exists in plasma.
- E. None of the Above.

- 49. Bioavailability of a drug.
- 50. Drug plasma concentration.
- 51. Elimination half-life of a drug.

SEE NEXT PAGE FOR ANSWERS

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ANSWER KEY

INSTRUCTOR	QUESTION	ANSWER
Dr. Modyanov	Question 1	A
	Question 2	D
	Question 3	A
	Question 4	D
	Question 5	D
	Question 6	B
Dr. Jacobus	Question 7	E
	Question 8	B
	Question 9	E
	Question 10	E
	Question 11	B
	Question 12	C
Dr. Darvish	Question 13	C
	Question 14	B
	Question 15	C
	Question 16	A
Dr. Dignam	Question 17	B
	Question 18	C
	Question 19	C
	Question 20	B
	Question 21	E
	Question 22	C
Dr. Rosenberg	Question 23	B
	Question 24	C
Dr. Reimann	Question 25	D
	Question 26	E
	Question 27	E
	Question 28	D
	Question 29	C
	Question 30	E
	Question 31	E
	Question 32	D
	Question 33	E
	Question 34	A
Dr. Mellgren	Question 35	B
	Question 36	B
	Question 37	E
Dr. Repka	Question 38	D
	Question 39	A
	Question 40	E
	Question 41	C
	Question 42	D
	Question 43	C
	Question 44	D
	Question 45	D
Dr. Sanchez	Question 46	D
	Question 47	A
	Question 48	B
Dr. Wilkerson	Question 49	B
	Question 50	A
	Question 51	E

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ANSWER KEY

INSTRUCTOR	QUESTION	ANSWER
Dr. Koechel	<u>See page 156-157 (Handout)</u>	
	Question 1	
	Question 2	
	Question 3	
	Question 4	
	Question 5	
	<u>See page 176-177 (Handout)</u>	
	Question 1	
	Question 2	
	Question 3	
	Question 4	
	Question 5	

Id #: 100874
Name: FATE, TROY D
Date: 9-24-1997

Class: MED BIOCHEM
Time:

Course #: MEDBIO

Test Key: CEBCEBACAC	EDEEDBEBCEB	CBBBABDAAE	AACEACEABE	BCCEBCAC
Items 1-50: 1234567890	1234567890	1234567890	1234567890	1234567890
Student's Answers: *****E**CA	B**B*****E*	*AA*****	****E*D***	***A*****

Test Key: DEAD				
Items 51-100: 1234567890	1234567890	1234567890	1234567890	1234567890
Student's Answers: **BC				

EXAM 1 Form A

Possible Points: 54
Raw Score: 41
Objective Score: 41
Essay Score:
Percent Correct: 75.9%

Comments:

CUMULATIVE

Possible Points: 54
Raw Score: 41
Percent Correct: 75.9%
In-progress Grade: P

Code: